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Development of Standard Operating Procedures For The Formation of Partnerships With Suppliers of The Caterpillar Corporation

A Research Project

By

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Introduction

Manufacturers world wide are seeking ways to reduce costs without lowering the quality of their product. The cost of purchased materials alone accounts for more than sixty percent of manufacturers' expenses. In a market where quantity is giving way to quality, inefficient suppliers are being passed over. This causes suppliers to become prime targets for cost cutting by big companies. Only suppliers with the highest quality product, delivery record and desire to meet the needs of the manufacturing sector will survive (Kelly, Schiller & Treece, 1993).

The traditional view of the supplier-manufacturer relationship has been adversarial. Manufacturers placed emphasis on multiple-sourcing with competitive bidding to acquire short-term contracts (Watts & Hahn, 1993). Technology sharing between the buyer and supplier was limited, with joint development of work projects being non-existent. Work on new projects was awarded to a supplier primarily on the basis of the low bid (Stuart & Mueller, 1994).

Cooperative manufacturer and supplier relationships are lacking in the United States. Manufacturers and buyers of many varieties are utilizing suppliers outside of the country to attain the supplies they need at a lower cost and a higher quality. This is a dilemma for suppliers as they struggle to stay competitive. Manufacturers such as Caterpillar are seeking long-term partnerships with their suppliers to ensure positive business relationships in the future. By developing partnerships, manufacturers and suppliers may share information, conduct joint problem solving activities and share technology in a mutually dependent association.

Statement of the Problem

Manufacturing institutions and their suppliers are failing to maximize profits due to a failure to communicate with and work efficiently with each other as partners.

Misunderstandings in design structure, quality demands and delivery requirements are causing unnecessary costs. The traditional approach of buying a product from a supplier through competitive bidding is no longer practical.

The Caterpillar Large Engine Division (LEC) of Lafayette, Indiana is attempting to capture the process necessary to establish long-term partner relationships which will be equally beneficial to manufacturer and supplier. By capturing the partnership forming process, Caterpillar will be able to duplicate the significant steps necessary to create successful partnerships with future suppliers. Resources previously spent on development activities necessary to form a partnership such as supplier qualification, duplication of engineering efforts, supply delivery requirements, production processes, part specification requirements, travel time for coordination meetings, etc. could be reduced significantly. The implementation of partnerships will ensure mutual benefits for the supplier and the manufacturer as long as information is shared, improvement is continually sought and problems are solved through cooperative team efforts (Stuart, 1993).

Significance of the Problem

LEC is seeking to enhance its position in the world market as shown by its commitment to meeting the stringent demands of ISO 9001. In order for LEC to compete at the world market level, it must ensure that its product is of the best quality and made from the most cost efficient production processes. It is in LEC's best interest to ensure that its suppliers are also meeting international standards of production. The number of competitors in the world market is increasing on a daily basis. Significant competitors will arise form overseas markets such as the newly formed European Market and will demand an ever increasing share of the available world market.

Manufacturers who fail to conform to the ISO 9000 standards will quickly evaporate from the competitive market.

The number of supplier and manufacturer partnerships in the United States is primarily restricted to companies like LEC, which have sales over one million dollars. Watts and Kahn (1993) conducted a survey to gather information about the level of supplier development activities occurring by members of the National Association of Purchasing Management. Five hundred companies were randomly chosen to be surveyed, with 81 usable responses returned. Sixty-three percent of the usable responses indicated some sort of supplier development program (SUP). Had LEC been surveyed, they too would have fallen within this elite sixty-three percent of manufacturers who conduct some sort of supplier improvement program. LEC realizes that by making a supplier more productive their profits will increase as costs are reduced.

LEC plans to work closely with selected suppliers who are willing to take the extra steps necessary to produce a quality product. Periodic inspections will be conducted to ensure quality products are delivered consistently on time. Less productive suppliers will be eliminated in an attempt to reduce the supplier base. However, inspections conducted by the top manufacturers are inconsistent. Inspections are occurring anywhere from once a year to a day-by-day evaluation. Studies have shown that the inspection programs have no standard format, with objectives as varied as the number of participants in the programs.

The study also stated that buyers are using suppliers to improve their products, but not necessarily the supplier. Buying organizations still focus on current costs and quality rather than taking steps to improve future costs and quality by collaborating to improve their suppliers. LEC has implemented partnership type programs in the past

which focused on improving the product and the suppliers' operations. By capturing the formal partnership building process in a document form, LEC may significantly reduce the time and resources necessary to create partnerships with new suppliers. The importance that a company places on evaluating and working with suppliers directly affects gross sales. Those companies which fail to consider the importance of developing strong supplier partnerships may be placing the future viability of their organizations at serious risk (Watts & Hahn, 1993).

Purpose

The purpose of this directed project was to develop a standard operating procedure (SOP) for use by the Caterpillar Large Engine Division of Lafayette, Indiana to use as a procedural guide for the establishment of partnerships. The SOP needed to include the criteria used to select new suppliers as long-term partners of CAT. Information obtained from CAT and at least two of its suppliers was to be combined with literature researched by the author. The result was to be a document for use by the management of CAT, consisting of the most up-to-date information available for the establishment of partnerships.

Objectives

The major objectives used to develop an SOP for the development of partnerships for LEC to use were:

1.) to identify the current procedures used by Caterpillar and its suppliers to form partnerships by reviewing current Caterpillar policies and conducting interviews with significant players at Caterpillar and its suppliers.

2.) to seek the most current information available on building partnerships through literature research, and apply the information in the form of a proposed SOP for the management of Caterpillar to review for practical application.

3.) to submit a new SOP for Caterpillar and its suppliers to use when forming partnerships.

4.) to allow Caterpillar and its suppliers the opportunity to evaluate and validate the SOP.

Definitions

For the purpose of this proposal, the following terms are defined as:

ISO 9000 (International Organization for Standardization) - A series of written quality standards which standardize the requirements for goods and services produced under the guidance of the International Standards Organization.

JIT (Just In Time) - A distribution technique used to deliver a product to the point of use just as it is needed rather than stocking the product in a warehouse as inventory until it is used.

Multi-sourcing - The gathering of multiple competitive price bids from a variety of suppliers in order to choose the least expensive bid which meets the manufacturer's requirements.

SUP (Supplier Development Program) - A program used by manufacturers to improve the productivity of its suppliers.

Partnership - A long-term agreement between a manufacturer and a supplier to jointly share the resources necessary to deliver a product to market. A partnership also includes: mutually agreeable corporate philosophies, an open attitude towards the sharing of technology, the willingness to share costs equally, and the will to establish open lines of communication to facilitate the flow of information.

Review of Literature

Partnership Development

The majority of partnerships formed throughout this century have been service based. The manufacturer needed the services of the supplier in the form of raw materials and parts. Likewise the supplier depended on the manufacturer to buy his product. Loyalty between the manufacturer and supplier was only as good as the best price offered. Available literature focused on the establishment of partnerships with long-term commitments. Partnerships do not happen overnight, but are a result of commitment by the supplier and manufacturer to produce a quality product which satisfies the needs of a customer, while making a profit. Research on partnerships in the United States during the 1980s and early 1990s focused primarily on the automobile industry. The literature used in the research project was dated since 1992.

Partnership Selection Criteria

The literature available focused on the selection criteria which manufacturers use to select suppliers as future partners. Two of the supplier selection processes used as measuring sticks were developed by Stuart (1993) and Smytka and Clemens (1993). Stuart developed a comprehensive model which demonstrates the impact of competitive pressure, the importance of purchased inputs, purchasing capabilities, purchasing philosophies and committed resources on the ultimate success of partnerships (see Figure 1). Each of the factors were correlated with each other and their impact on the formation of partnerships. A summation of the results indicated that increased efforts to use any of the factors had a positive correlation on efforts to form partnerships. Figure 2 demonstrates that there is greater opportunity for interaction between the efforts to form a partnership is increased over time and results in a positive correlation between the efforts needed to form a partnership.

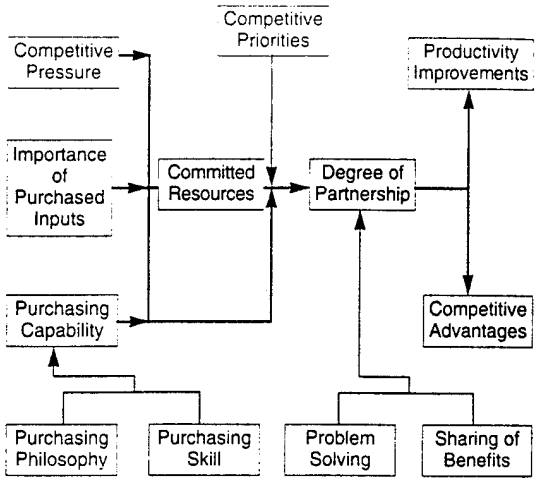

Figure 1. A model showing various factors which influence partnerships. Competitive pressure, management's importance of purchased inputs and the purchasing capability directly effect the level of commitment and resources dedicated to purchasing and its materials management responsibilities. Management then reviews competitive priorities and commits resources to form the partnership. The degree of partnership developed is a direct effect of the problem solving and benefits achieved in the partnership. Productivity improvements and competitive advantages will be determined by the degree of partnership that is formed.

	Competitive Pressure	Importance	Purchasing Capability	Purchasing Philosophy	Purchasing Skill	Committed Resources	Degree of Partnership	Problem Solving	Sharing of Benefits	Competitive Advantages	Productivity Improvemen
Competitive Pressure	1.0	.42	.28	.42	.11	.20	.37	.32	.38	.37	.34
Importance		1.0	.39	.40	.30	.30	.44	.42	.40	.46	.39
Purchasing Capability			1.0	.86	.80	.40	.78	.80	.66	.64	.67
Purchasing Philosophy				1.0	.57	.30	.72	.71	.64	.63	.62
Purchasing Skill					1.0	.39	.67	.70	.55	.51	.57
Committed Resources						1.0	.52	.51	.47	.45	.35
Degree of Partnership							1.0	.94	.93	.79	.74
Problem Solving								1.0	.76	.71	.69
Sharing of Benefits									1.0	.77	.69
Competitive Advantage										1.0	.73
Productivity Improvement											1.0

Figure 2. A correlation matrix for major constructs used as evaluation criteria when forming partnerships.

Smytka and Clemens developed a weighted point decision matrix to evaluate suppliers based on a quality performance, delivery performance, technical capability, quoted price, and service factors. The matrix is an easy understanding of two suppliers with their overall evaluation represented by the total column (see Table 1). The shortcomings of the matrix are that it fails to properly represent supplier costs and the matrix is subjective and could not be used universally by all manufacturers' as a tool for evaluating suppliers. Each manufacturer may place different weights on the evaluation criteria, making the evaluation inconsistent across all supplier evaluations.

Evaluation Criteria	Importance Weight	Supplier A		Supplier B	
		Score	Total	Score	Total
Quality Performance	16	9.6	154	9.3	149
Delivery Performance	22	8.1	178	7.6	167
Technical Capability	8	10.0	80	8.0	64
Quoted Price	44	7.5	330	9.3	409
Service Factors	10	6.4	64	8.8	88
Total	100 %	/////	806	/////	877

Table 1. Simplified weighted point decision matrix. Each evaluation criteria is weighted according to the importance the manufacturer placed on the criteria. The suppliers are evaluated and scored on their ability to perform each of the listed criteria, with the score multiplied times the "manufacturer specific" weighted point value for each criteria. The scores are totaled for an overall evaluation score.

Trends in Manufacturer-Supplier Relationships

At the turn of the century, Henry Ford thought he had the perfect structure for manufacturing the automobile, "vertical integration." Through vertical integration, Ford produced everything from the rubber needed for tires, to the steel for the body chassis.

No outside suppliers were contributors to the Ford automobile. Ford's concept eventually became outdated as more efficient producers of vital supplies such as rubber and steel emerged in the market. Manufacturers and suppliers became dependent on each other to produce the products demanded by the populous. Although not formally stated, these earlier 20th century manufacturers and suppliers were partners in a crude way.

The Japanese emerged in the 1980s as the manufacturing giants of the world. The economic prosperity the Japanese attained offered promises of lifetime employment with enduring relationships between manufacturers and their subcontracting suppliers ("Japan Discovers," 1993). The extreme loyalty that manufacturers demanded from their suppliers as partners played a key role in the Japanese success story. Suppliers were allowed to provide parts only to the auto manufacturer for which they had designed parts. This system assumed that the supplier would always have business. With each auto manufacturer designing its own parts, the consumer was assured a variety of autos to choose from with an accelerated price tag.

Separate suppliers, each designing and producing their own products, required the duplication of machinery and engineering efforts. This caused the price of the auto to rise unnecessarily. The Japanese automakers' closed minded attitude towards outside suppliers eventually caused the price of their autos to exceed American and European auto costs. In their struggle to remain competitive in quality and price, Japanese auto makers were forced to conduct joint ventures with competitive manufacturers. The Japanese have realized that the formation of partnerships between the buyer and supplier is critical to survival in the manufacturing world.

Current supplier and manufacturer relations are moving in four directions. The first direction is forming animosity. Animosity is being created as manufacturers force suppliers to cut costs without concern for the suppliers well being. Small companies are being warned to assess the payoff when dealing with the larger companies ("Putting The", 1993). Frequently pressure from a large business partner may force the supplier into unprofitable situations. The business partner may be the only buyer of the suppliers product and can easily dictate terms.The supplier, in order to stay in business, may have to produce a product and sell it to the large business partner for a much smaller margin than would have been obtained in an open market with multiple buyers.

Suppliers are also producing materials that are being used by competitive manufacturers at the manufacturers' request. This strategy is lowering the cost of production for each of the players in what is called a "multi-level partnership." The multi-level partnership can move horizontally between manufacturers or vertical between manufacturers and suppliers. The literature suggested that a major movement towards eliminating the Ford type of vertical integration is in process. For automakers, the reduction in vertical integration has provided opportunities to lower costs, improve flexibility in manufacturing and access to new technologies (Taylor, 1994).

The third initiative described is the movement towards reducing the supplier base. Unproductive suppliers are being eliminated as business partners, allowing manufacturers to become closer to their remaining suppliers. With fewer suppliers, manufacturers are able to work closer with the remaining suppliers to improve working relationships. An example of how the supplier base is being reduced is happening in the Japanese car manufacturing industry. Japanese car manufacturers are sharing

supplier resources with their formerly formidable enemies; other car manufacturers. Initiatives such as joint ventures in part production are lowering costs. Traditional single-sourcing with suppliers is becoming an extinct practice. Nissan and Toyota are jointly procuring parts from JARCO, a supplier of gear boxes. With JARCO designing and supplying parts, engineering and production machinery costs are being reduced up to 66%.The final initiative discussed in the literature was the voluntary price cuts which manufacturers asked suppliers to provide to help reduce costs.

Large companies are calling on the mutually beneficial partnerships formed in the 1980s as a reason enough for suppliers to offer up lower prices. Some manufacturers are playing hardball with their suppliers, trying to get the lowest possible price. Former GM Director of Purchasing, Jose Ignacio Lopez, practically cut the legs out from beneath suppliers. The contracts that Lopez demanded be reopened in 1992 forced suppliers to reduce prices by 20%. This initiative saved GM over $4 billion in cumulative purchasing costs by the end of 1993. As a result of this aggressive action, GM was alienated from its suppliers and is currently trying to rebuild the loyalty bonds they once had (Kelly, Schiller, Treece, 1994).

Considerations for Partnership Formation

Five areas of major concern were identified which manufacturers and suppliers must consider before attempting a partnership. The areas for consideration include: an understanding of the firm's own internal communication system, the ability to evaluate the type of product demanded, use of the appropriate supplier selection criteria, the establishment of inter-organizational channels of communication and the follow through after production has begun. Before a company can develop a relationship with a supplier, it must fully understand and evaluate how information is

passed within its own organization. The internal communication system consists of internal operations, internal relations, and the conduct of management.

Hedlund (1994) developed a model which aids in understanding the internal communication process by understanding how the flow of "Tacit" and "Articulated" knowledge works within a firm. Tacit knowledge is defined as the non-verbalized or non-verbalizable, intuitive, and unarticulated knowledge that is passed within a group. Articulated knowledge is specified verbally or in written documents, computer programs, patents, or drawings. The concept model shown in Figure 3 demonstrates the interaction between carriers of information including individuals, groups, organizational and interorganizational domains. All of these carriers of information must be functioning properly using the concepts of articulation and internalization; extension and reflection; and assimilation and dissemination. Hedlund describes his model in the following paragraphs.

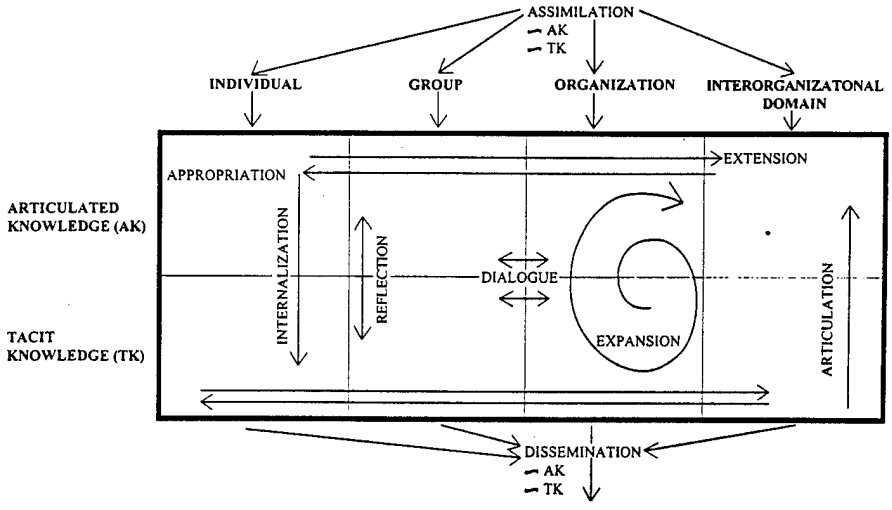

Figure 3. A model of knowledge categories and information transfer processes depicting the types of transfer and transformations that must occur for communication to be successful.

> Articulation refers to tacit knowledge being made explicit, articulated. This can take place at all four levels in the model. Articulation is essential in facilitating transfer of information, but also for its expansion and improvement, allowing for open scrutiny and critical testing. Internalization encompasses how an individual understands and uses information. This occurs when articulated and tacit knowledge mix and cause reflection. Extension is the transfer of knowledge from lower to higher agency levels in articulated or tacit form. An example of articulated knowledge would be when a company transfers drawings of its planned or future products to its subcontractors.
>
> The transfer of tacit knowledge occurs during the teaching of complex, practical skills, as when a management consultant teaches a group of younger colleagues by working together with them on a project. Appropriation happens when a company teaches its new employees about its products. (p. 76)

The N-form corporation stresses organizational capabilities, rather than product market positions or tactics, as the enduring source of advantage in a competitive market. Large Western corporations specialize in radical innovation. The large firms tend to exploit rather than promote innovation. When comparing large firms in the US to those of their competitive Japanese counterparts, a definite advantage goes to the Japanese. The Japanese firm promotes multiple small improvements and the rapid incremental improvement of knowledge. In contrast the typical US firm is inflexible, characterized by tightly specified and articulated systems of knowledge. The major advantage the Japanese have is a permanence of staff and interorganizational relations and an intensive dialogue which fosters the relations. Hedlund (1994) sums

up his position with the following conclusion. The Japanese prefer to work with induction, lists, and various combinations. The Western bias is for deduction, hierarchical classification, and division within the workplace. The Japanese preference is more likely to lead to many small steps, while the Western prefers single, large reconceptualizations or inventions.

The second step necessary before a partnership can be developed is the understanding by the partnering firm of the type of product that is being demanded. Wilson (1994) separated the type of products into the following categories: routine order, procedural problem products, performance problem products, and political problem products. An example of a routine order product is the disc brake pad used in most vehicles today. No special skills are required to install the pad and the assembler should have no problems learning how to attach the pads. Routine products must be delivered on time and have a competitive price.

Procedural problem products are reliable, but there may be problems in learning to use these products. Procedural problem products are characterized by greater service and delivery requirements. Performance problem products create some doubt about their ability to perform satisfactorily. Again, service and delivery are the key performance criteria for these products. Finally, political problem products require a large outlay of capital and buying decisions are likely to involve people from several functional areas within the organization. Price, reputation of the supplier and product reliability are the most important performance criteria of political problem products.

Once a firm determines which product attribute is important for a given product, the firm must decide which supplier will provide the product. This choice is made utilizing supplier selection criteria. The manufacturer must determine

what the necessary criteria is for forming a partnership. Historically the selection criteria used to determine a supplier have been quality, on-time delivery, service, and price. Quality is a direct result of performance criteria. "How well will the product do the job?" Price considers not only the cost of the product, but also the various cost outlays associated with buying the product. Service is comprised of integrative criteria, asking if the supplier is customer oriented and committed to meeting or exceeding the buyer's expectations. Finally, the delivery criteria asks if the supplier is adaptive and capable of producing and delivering to specification, and what legal issues and policy constraints might arise when purchasing this product?

The research demonstrated that supplier selection criteria has changed over the last thirty years. According to Wilson (1994) the precedence for performance criteria in 1966 were: quality, on-time delivery, supplier performance history, and lastly, price. In 1974 buyers ranked delivery as the most important factor followed by price, quality and service. Quality and price were nearly equally important in 1982, followed by service and on-time delivery. Wilson concluded that quality and service decisions tend to dominate price and delivery capabilities in the mid -1990's.

Several systems were identified in the research for evaluating potential suppliers as partners. I will review the two procedures which are most relevant. Smytka and Clemens (1993) developed the weighted point decision concept matrix shown in Table 1 to evaluate suppliers based on quality performance, delivery performance, technical capability, quoted price, and service factors. The matrix provided an easily understood evaluation of a potential supplier. The shortcoming of the matrix was that it was subjective and could not be used universally by all manufacturers as a tool for evaluating suppliers. This matrix appears practical for use by LEC, Morey and Victor Reinz.

Stuart (1993) developed a comprehensive model which measures the impact of competitive pressure, the importance of purchased inputs on purchasing capabilities, purchasing philosophies and committed resources on the ultimate success of partnerships. Each of the factors were correlated with each other and their impact on the formation of partnerships. A summation of the results indicated that increased efforts to use any of the factors had a positive correlation on efforts to form partnerships as shown previously in Figure 2.

Once the selection criteria are determined, a thorough review of potential suppliers must be performed by a buying team. The review includes visits to a manufacturing facility, interviews and information sharing. The management philosophies of the supplier and manufacturer should be evaluated for agreement in commitment to quality and cost improvements over time. This type of commitment is time consuming and expensive, encouraging the purchasing firm to make longer term commitments and to limit its width of supply.

Gooley (1994) suggests five areas that manufacturers should focus on when forming a partnership: (a) concentrate business with relatively few partners. By dealing with fewer suppliers, the manufacturer gets better pricing and service because of working with the supplier so often. (b) Carry out joint improvement efforts with partners. In the research and development area, joint improvement efforts will lead to improved technology, reducing costs as duplication of effort is eliminated. (c) Institute a formal system for measuring partners' performance. A formal system of measurement will verify the suppliers compliance with the contract agreements and help to identify trouble spots. (d) Let partner performance determine price levels as compensation. Better performance should be rewarded with just compensation. Those suppliers or manufacturers who perform at or above the set standard should be compensated

accordingly. (e) Employ a two-way feedback system. Communication between partners is critical. Partners need to discuss problems and decide on courses of action to take when plans arise unexpectedly.

Method

Subjects

This research project was focused on data obtained during interviews with representatives of Caterpillar LEC of Lafayette, IN , the Morey Corporation (Morey) of Downers Grove, IL, and Dana Corporation's Victor Reinz Division (Victor Reinz) of Lisle, IL. Two German suppliers, Goetze AG, D-5093 (Goetze) Burscheid, Germany, Koelbenshmidt AG, D-7107 (Kolbenschmidt) Neckarsulm, Germany, were also included as part of the survey, but only Kolbenschmidt returned the survey in time for the submission of this report. Morey develops circuit boards for use in highly technical equipment such as aircraft communications and control panels for LEC engines. Victor Reinz produces gaskets for the majority of engines produced around the globe. Kolbenschmidt produces crankshafts for use in a variety of combustion engines.

One-on-one interviews were conducted with representatives from each of the US suppliers and a written response was obtained via fax from Kolbenschmidt. The names of the interviewees, their job title and respective firms are as follows:

Name	Company Represented	Job Position Title
John Link	Caterpillar LEC 3600 Division	Procurement Officer
Jim Kondziolka	The Morey Corporation	Quality Assurance
Gregory DiMarco	Dana Victor Reinz	Sales Manager
John G. Pavlik	Dana Victor Reinz	Account Manager
K. Griesbach	Kolbenschmidt AG	Engineering
W. Hartman	Kolbenschmidt AG	Sales Representative

Materials

Research of pertinent information from published text and journals provided the ideal concept of what a partnership is supposed to be. Two separate survey questionnaires, one for Caterpillar LEC and one for each of its suppliers, were prepared to test the five areas of major concern proposed in the review literature. The surveys were designed to legitimize the five areas of major concern. An in progress review of a control panel for a Caterpillar engine was also attended to better understand the type of individuals attending the meetings and the interaction that occurred at the meetings.

Procedures

Six steps were used in the accumulation of the information necessary to form the standard operating procedure for use at Caterpillar LEC. The first step consisted of a meeting with the acquisition officer for Caterpillar LEC's 3600 engine, John Link. Goals and objectives of the research project were discussed and arrangements were made to attend an in-progress review meeting for a control panel used in the 3600 engine. Separate meetings with suppliers of Caterpillar LEC were also scheduled to be held at the suppliers' locations. The suppliers chosen were working with Caterpillar LEC on the 3600 engine control panel.

Secondly, documents used by Caterpillar LEC were procured and reviewed for content. They included Caterpillar's Quality Guide For Suppliers, Supplier Guideline for Preparing Quality Plans, an example of a current contract agreement, Point 4 of Caterpillar's Eight-Point Quality Plan, and minutes taken from two progress review meetings with Caterpillar suppliers. At the start of the project no documentation existed at Caterpillar LEC specifically outlining the formation of partnerships.

The third step involved attending a meeting with suppliers of Caterpillar LEC, to discuss the progress and improvements being made on a control panel for the 3600 engine. In attendance at the meeting from Caterpillar LEC were: the coordinator and head of 3600 engine acquisitions, engineers from each engineered system, the project engineer, and a technical consultant from the Peoria, IL Caterpillar plant . Two suppliers were also in attendance at the meeting. The Morey Corporation was represented by a sales manager and the corporation quality control officer. Morton Metal Craft was represented by a purchasing representative and an engineer. There was not an end user of the control present at the meeting. The purpose of the meeting was to discuss the progress that had been made on the control panel for the 3600 engine. This meeting was one in a series of meetings to track the process of a contract agreement between Caterpillar, The Morey Corporation and Morton Metal Craft. The meeting was an open discussion led by the acquisition officer of Caterpillar LEC. Some of the items discussed in the meeting included:

a. improvements made to the design structure of the control panel;

b. the status of previously agreed upon changes to the design of the control panel;

c. problems adhering to JIT type delivery requirements;

d. the ability to meet projected construction schedules already in place by the supplier; and

e. potential cost savings through the use of different materials on the control panel;

The personal observations of the author were that the discussion within the meeting was open and free flowing. Representatives who had an interest in the part of the control panel were present at that portion of the discussion and did not attend the

entire meeting. This kept the attendees of the meeting to a minimum and made the most efficient use of everyone's time. One supplier admitted having problems meeting design specs which nearly forced them to pass the job onto a competitive producer. Another issue raised in the meeting was the speed at which design specifications reached the suppliers from Caterpillar LEC.

The next step involved a review of current literature available on the formation of partnerships. Surveys were developed from the literature review to interview LEC and its suppliers. The results of the survey were used to evaluate LEC's process of building supplier partnerships to the information provided in the literature review. The survey formats are in Appendix A.

The fifth step in the project combined the information obtained from the survey interviews, group meeting and current literature into an SOP to propose to Caterpillar's management for practical use in developing partnerships. The final step involved a critical review of the proposed SOP by the management of Caterpillar in order to gain feedback on the practicality of the proposed SOP. After the review of the SOP, LEC proposed that the name of the SOP be changed to a "methodology" for this project.

Results

The methodology guideline shown in Appendix C was developed from a combination of research data published since 1990 and survey information obtained from LEC and four of its suppliers. The result is a document consisting of a methodology for use by the management of LEC to use as the most up to date procedures for creating a partnership. Included in the methodology guideline are procedures covering internal communications, product recognition standards, supplier selection criteria, and inter-organizational communication channels. The completed

project captures the procedures used by Caterpillar to develop a partnership, the criteria and policies used to evaluate a potential supplier partner; benefits and potential disadvantages the supplier and manufacturer may encounter in a partnership; and how the philosophies of the manufacturer and supplier view the partnership philosophy.

It is important to note that two of the three suppliers used for this research project have been suppliers of Caterpillar for more than twenty years. It appeared to the author that there was a large potential for bias in the survey responses. The answers obtained in the surveys were intended to be open, with the intention of improving an already sound system of partnership development. The author did note that some answers seemed to be politically discrete, understandable in such a competitive industry. Some information that would have been extremely beneficial to this project borders on the verge of trade secrets and confidentiality between Caterpillar LEC and its suppliers.

Each survey interview began by having the interviewee explain what they understand a partnership to be. Four of the six interviewees suggested that a partnership is much the same as an alliance. The author contends that the meaning of an alliance was skewed slightly by the interviewees. According to Sasaki (1993) an example of an alliance is the formation of agreements between horizontally competitive firms, such as GM and Toyota. These firms share information in order to boost sales while competing for the same customer. A partnership is more vertically aligned as the partners share technology, engineering skills, market strategies etc. to produce a mutual product for a determined customer. The remainder of the interviewees considered a partnership as the close cooperation for the mutual benefit of both parties.

LEC believes that in order for a partnership to work there must be strong commitment, with a lot of effort and dedication. A partnership is not an overnight event. It takes many years, possibly decades to develop a relationship with a partner that eliminates the need for constant inspection and supervision between the supplier and manufacturer. LEC uses a standard evaluation form to evaluate a potential supplier and its commitment to continuous improvement and the corporate beliefs and ethical practices of the potential supplier. The form also helps to develop a supplier "profile" which LEC can use to evaluate the suppliers capabilities. Areas included on the form are manufacturing facilities, quality facilities, human resources, technical support and material support, conformance control and communications.

LEC deals with an average of 30 of its more than 400 suppliers on a daily basis. Suppliers are evaluated according to the degree of importance of a product, the dollar value of the part, and the critical nature of the part (does not have to be a high dollar part). When asked how LEC determines whether a supplier is considered a major supplier or not, Link states that "no single criteria can place a supplier in the 'major' category."

LEC believes information sharing, problem-solving activities and inter-dependency between supplier and manufacturer as being critical. Information sharing takes many forms between LEC and its suppliers to include: face-to-face interaction for contract negotiations, progress reviews and design conceptualizations, fax to transmit contracts, engineering specification changes, price quotes, and field audit information from inspection programs. LEC provides forecasts each year with a 14 month advance notice of manufacturing requirements, and affords suppliers the ability to check their own profiles by use of electronic data interchange (EDI) . Additional

information shared by LEC on a biannual basis is a status report of Caterpillar's financial status, goals and commitments.

LEC believes that the problem-solving process begins at the beginning of the design stage for any new product. Design problems in concept, engineering, production or delivery must be worked out in the early stages of development of a product. Technical and commercial personnel are responsible for eliminating as many design problems as possible. Special agreements are used to allow production to continue when design limitations prohibit feasible production of a part. Problem-solving teams are used to eliminate unexpected problems and make improvements to already existing equipment as part of Caterpillar's commitment to continuous improvement.

LEC considers a "satisfied customer" as the primary advantage when forming partnerships. When LEC and its suppliers work together as a team, relations are kept more open. Technical and managerial decisions are made more responsively because the personnel working on the problem understand each other from years of working together. Reputation mean a lot when working with a partner. When one partner knows the other partner will deliver on time, scheduling, buying and selling are made much easier.

Disadvantages do exist in a partnership according to LEC. Since each partner expects the other to deliver a given part on time, slow downs in delivery have a major impact on production and delivery schedules. LEC's goal is to practice just in time (JIT) delivery with single-source major suppliers. A major sole source supplier who fails to deliver on time can become very costly as production is stopped and deliveries to customers becomes delayed. This can have a domino effect within the factory as parts planned as replacement parts are diverted into production lines. Increased cost will

result as overtime is authorized to catch up on production runs. In the meantime, a shortage exists on replacement parts which may have to be mailed out from the suppliers location at increased costs.

With a goal of single sourcing, failing to deliver a part puts LEC in great risk of satisfying the customer. LEC believes that each situation must be evaluated individually. External factors can impact a planned delivery of a product which LEC and its supplier partners may have no influence over. Labor strikes, natural disasters, the business condition of the economy and supplier must all be considered before forming a partnership. In cases where a partner cannot meet delivery requirements, LEC will find a temporary supplier until the partner supplier can provide the needed materials.

Responsibilities are divided up with a supplier before, during and after the planned production of a part. Development agreements like the one shown in Appendix B, divide the responsibilities between the supplier and manufacturer. Special agreements agreed upon after production has begun, will continue to divide the responsibilities through the life of a part. Visits to the supplier's location occur at least once a year by LEC personnel to conduct annual reviews. During the development of project agreements, visits are alternated between the supplier and manufacturer sites until the agreement is completed.

In the past thirty years, the priority for the qualities of price, service, on time delivery and quality have changed. LEC believes that all the qualities are equally important. It is unacceptable to have one of the four qualities lagging behind the others. The bottom line is that LEC needs to do whatever is necessary to meet the demands of the customer. When selecting a supplier for a part, quotations are issued to the qualified suppliers. The supplier will submit a purchase package as a bid for the

contract. LEC considers reliability of performance of the supplier and the quality of the product as part of the purchase package. Even though a supplier may be cheaper in overall costs, the contract could be awarded to a supplier with a proven record of quality, service and on time delivery.

Traditionally, manufacturers considered their partners as anyone who they could do business with and make a profit. Major emphasis was placed on competitive bidding to acquire short-term contracts, ensuring a "multiple-source" of suppliers (Watts & Hahn, 1993). Loyalty between the manufacturer and supplier was only as deep as the size of the dollar made from the last contract. Figure 4 compares the traditional and supplier type relationships, clearly demonstrating the difference in the two philosophies.

After a contract is awarded there may be times when the design specifications of a product may change. These costs are shared equally between LEC and its suppliers. When an error is detected by LEC, a deviation or non-conformance complaint is issued to the supplier. The supplier is expected to cover the costs of the errors in order to meet LEC's purchase order requirements. Changes initiated specifically by LEC will be absorbed in the price charged LEC by the producer. The usual procedure is for LEC to send a letter of rejection to the supplier. The supplier is then required to return a written correction document to LEC. These procedures are usually handled by letter mail, Fax or EDI. Should the problem escalate a phone call will be made describing the seriousness of the matter, followed by another written response.

Occasionally there will be a supplier who does not meet a deadline due to management incompetence. LEC will attempt to counsel the supplier's management on how to correct the problem and provide the product on time the next time. Shifts in

management philosophy, which frequently happen after Betsy, provide the product on time totally contrary to LEC's management philosophy. If so, the working relations with the supplier may be terminated.

Traditional Approach (an extreme illustration)	Supplier Partnership
Primary emphasis on price	Multiple criteria including management philosophy
Short-term contracts	Longer term contracts
Evaluation by bid	Intensive and extensive evaluation
Many suppliers	Fewer selected suppliers
Improvement benefits are shared based on relative power	Improvement benefits are shared equitably
Improvement at discrete time intervals	Continuous improvement is sought
Problems are supplier's responsibility to correct	Problems are jointly solved
Information is proprietary	Problems are jointly solved
Clear delineation of business responsibility	Quasi-vertical integration

Figure 4. A comparison between the traditional style of price bidding for a business and the characteristics inherent in true partnership building efforts.

LEC is very careful not to release to its suppliers any more information about a production process or technology needed in the design of a product than is necessary. Some technologies are trade secrets which give LEC an edge in the market. Non-disclosure agreements allow for the transfer of technology between the supplier and LEC through the development of a product. Non-disclosure agreements require the parties sharing information not to disclose the information for a length of time agreed upon in the contractual agreement.

To aid in the transfer of technology, LEC conducts extensive training for those areas of an evaluated supplier that have been identified as being weak. LEC uses open meetings, quality issue type meetings and provides taped classroom instruction from its technical institute for resale to qualified suppliers. Many improvements have occurred at LEC as a result of the sharing of technology. The most recent development as a result of the sharing of technology has been the development of the control box for the 3600 engine and the heat treatment process used on all LEC products. Each has resulted in a product that is the standard for the heavy equipment industry.

Two very unique answers were given as definitions of a partnership by two of the suppliers of LEC. Kondziolka (1995) believes that a partnership is vertically integrated, not horizontally. A true partnership must have the partners communicating with each other, not just paying lip service to a faddish new term. Too many firms say they are in a partnership with another company, but in reality they are just paying lip-service to their partner. Many firms practice the partnership ideology by throwing in a lot of "Yeah buts" into their meaning of a partnership. Partners must just "do it!" They must live up to the standards of their partnership agreements and quit finding reasons to deviate from their partnership contracts. The ideal partnership will continue to make a product, "cheaper, easier and faster," the longer the partnership is in effect.

DiMarco (1995) of Victor Reinz sees a partnership as a marriage. There exists a lot of give and take in a partnership, much like a marriage, and in the end it will be a 50/50 proposition. The goal of a partnership is to make money in the most efficient manner possible. Pavlik (1995) believes most partnerships start from a field problem out of necessity. The partners come together in a mutual agreement, trying to solve the problem of satisfying a mutual customer.

Morey has been doing business with LEC for over twenty years. Victor Reinz has been associated with LEC since the 1930's. Both suppliers consider themselves to be in partnership type arrangements with LEC. However, the author did detect that all was not perfect. It is interesting that a formal attempt at creating a partnership first started between LEC and Victor Reinz in 1989. Pavlik (1995) believes that the partnership is a 40/60 spread in the favor of the manufacturer. The partnership which currently exists between Victor Reinz and LEC can be categorized as being somewhere between the partnership management-type activity and post-contract stage of development . By practicing "quality function deployment" (QFD) and utilizing the "house of quality," Victor Reinz will reach the post-contract stage with LEC in the near future. Kolbenschmidt believes they are are also in the post-contract stage of partnership development after 10 years of doing business with LEC.

Kondziolka (1995) emphasizes the need for a partnership team to understand the true goals. He compares a partnership to being much like the cadre of a basic military training camp. Everything the cadre does has a reason. The sum of the reasons is equal to a finely tuned soldier; fit and knowledgeable in the field of soldiering. The sum of the reasons in a business partnership is to produce a product for a mutual customer that is of high quality. Partners need to get to the objective of the partnership and quit beating around the bush regarding each others' true intentions. A true partnership receives input not only from engineers and quality control technicians, but also from the worker on the assembly line and the end user in the field. The customer must have faith that the product being produced is the result of an equal, one hundred percent effort on each partners' efforts.

Both suppliers believe there could be improvements in the information and problem-solving activities that occur with LEC. Kondziolka (1995) believes that when

you bring partners together only to solve problems, their will be a degree of stifling and hesitation to voice opinions openly. Each job must be reviewed openly as the product is being designed and produced. Changes cannot happen by either the manufacturer or the supplier without consulting the quality departments on either end. Problem solving will occur more efficiently when the supplier and manufacturer develop an inter-dependency between each other that is built on trust and not apprehension.

DiMarco (1995) believes that the partnership with LEC is fully developed during the initial development of a product. More work is needed in efforts to increase cost savings. With seventy-five percent of the costs of producing a product tied up in research and development, a great deal of effort must be put forth in the design stages of the total product, not in separate parts produced by each partner. Pavlik (1995) believes that to improve development efforts, activities like having engineers at the same site during development should occur. Meetings should be held to review progress at all stages of development and to pass information freely about topics which may not be entirely centered on a product. An example would be the sharing of the latest milling techniques from one partner to another.

Many advantages do exist from having a partnership with LEC according to the suppliers. DiMarco (1995) believes that the duplication of design efforts has been eliminated because a level of trust exists between his company and LEC. Both expect a quality product from each other and no longer try to second guess each others' quality efforts. The flow of knowledge has increased greatly since the inception of their partnership with LEC in 1989. Kondziolka sees less finger pointing and more cooperative efforts towards solving problems. Information is being passed freely, making decisions easier to make and reducing the risk involved in the decision making process. Greisbach and Hartman (1995) see partnerships as aiding in the

ability to conduct long-term planning, a direct increase in quality, and the development of new products through better processes and technologies. Fair contract negotiations will also be a result of partnership agreements for Kolbenschmidt.

The disadvantages seen by the suppliers in a partnership with any kind of buyer are more philosophical than material. Pavlik (1995) stated that the members of a partnership are "marching to the beat of different stockholders," each with their own set of objectives. At times integrity may be put on the line as both partners work to meet difficult design specifications. Another disadvantage not usually recognized is that there are other buyers in the market who could readily take the place of the original buyer as a customer. The supplier is forced to play a game of accommodation as they strive to meet the needs of the buyer partner. There may come a time when the partner is asking too much and the supplier may decide to take their products and do business elsewhere.

When forming partnerships, suppliers believe they make themselves vulnerable because the buying firm may know too much. For example LEC may know their suppliers' production capabilities and weaknesses. If the supplier has a conflict of interest with LEC and refuses to meet a demanded price, LEC can leverage the partner supplier against other suppliers, forcing them to lower their price. Another risk run by suppliers of a major buyer like LEC is the loss of their identity. Should LEC decide they want only "LEC" insignia on their products, the quality supplier loses their name on their own quality product. The possibility of losing market share is increased because their name is no longer visible to the end user of LEC products. The risk of a "hidden agenda" in partnerships is also a concern of suppliers.

A significant amount of information sharing occurs in the process of developing a product. Most contract agreements have short term information confidentiality

statements. After the agreement expires, the manufacturer is free to pass the information to whomever they please. In essence, the data produced by a high quality supplier can be passed on to a lower priced supplier. Greisbach and Hartman believe that as long as pertinent information is shared in advance, the risks of forming a partnership are minimal.

Contractual agreements and purchase orders contain the majority of the verbiage that delegates responsibilities between suppliers and manufacturers. What is important to the suppliers is that decisions be made as a group. Standardized meetings with a standardized agenda, meeting at consistent intervals plays a key role in making the responsibilities understood to members of a partnership. Efforts made to walk the assembly line by engineers of the partnership would greatly enhance the understanding of each others' production processes. A LEC engineer would better understand how to design a fitting to hold a Morey circuit board or a Victor Reinz gasket. The engineers must make it their responsibility to design a product that complements their partners product.

Part of the interaction between the members of a partnership includes the visits made to the supplier's location by the manufacturer. Victor Reinz, Morey and Kolbenschmidt are in agreement that the majority of LEC visits to their facilities includes some type of progress review and the passing of relevant information. Victor Reinz uses these meetings as part of their "Focus Team" concept. The focus team is comprised of members of Victor Reinz and LEC to focus on the project at hand. The mission of the focus teams is to provide a readily accessible means of passing information between individuals who have come to know each other through group interaction. Both suppliers emphasized the need to work closely with the manufacturer and would like to see more sharing of information through the cross training of

engineers and placement of representatives at the buyer or supplier's location to better facilitate the intent of the companies policies and objectives.

There was a difference in the priority placed on the qualities of price, service, on- time delivery and overall quality. The supplier of the gaskets held service as most important, followed by quality, on-time delivery and then price. The supplier of the more sophisticated circuit boards and crankshafts placed quality as the most important factor in conducting business, followed by on-time delivery, service and then price. Both suppliers believed that they received their current contracts with LEC as a result of their commitment to the partnership. This may account for the reasons why they place the different priorities on the quality of performance of products produced in the past.

Each supplier considers themselves a major supplier for LEC. Demands for new products have evolved into a two-way street. The suppliers are asking for input to the design of new and existing products and LEC is asking for more input to improve currently produced products and the development of new designs. The suppliers believe that technology relating to the design of the contracted product is shared freely with LEC. Some hesitations still exists as the suppliers are forced to react to short lead times for parts. This causes the supplier to incur higher costs from overtime in trying to meet unscheduled production schedules. The profits are less than expected because the extra cost are not made up in price.

Changes in design specs are initiated differently for the suppliers. With Morey, approximately 75 percent of the design changes are initiated by LEC. Victor Reinz and Kolbenschmidt believe that design changes are about equal between the partners. Errors detected in a design are relayed telephonically to the supplier and followed through with a written document. A historical data sheet is calculated for

each supplier by LEC and is available to the supplier at any time. The data sheet shows the number of errors that the supplier has made over the past year and the return rate for products shipped. The suppliers use this sheet as a standard for improving their performance record over time.

All three suppliers believe that LEC is open to helping their company improve in any area they can. Since LEC is a leader in the large industrial machinery business, it is to their benefit to make their suppliers as good as possible. LEC has helped to make their suppliers more competitive in other market areas because of the strict demands they require. The suppliers agree that LEC is straight forward in its demands and the supplier has to be performing to a minimum level before LEC will deal with them. The strict standards have benefited LEC as well. Victor Reinz has aided LEC in developing Finite Element Analysis (FEA). FEA is a computer aided tool which allows the designer to simulate stress on a pro type product without the need to actually produce the product. This has been a significant aid in the lowering of research and development costs.

Kolbenschmidt is a non-typical supplier of LEC in that they have not received any technical assistant in the production of their product. The products they produce are unique for each of their customers. The close working relationships that LEC has developed with the other two suppliers is not as evident with Kolbenschmidt. This may be due to the fact that LEC has been actively pursuing partnership relations with Kolbenschmidt for less than two years.

Exit provisions are standard in a contract agreement with LEC. However, this would be detrimental to long-term relations as partners. Morey believes that the investment in the long-term commitment will negate the need for any exit provsions. Victor Reinz also agrees to having exit provisions with LEC, but hopes they prove to

be unnecessary. Pavlik (1995) states that a partnership takes at least 3-5 years before any kind of a level of trust is developed. Ideally, partnerships should exist for 10 to 20 years in order to develop the level of trust and commitment necessary to work together with one another without the need for constant checks on the partner's work and policies.

Kondziolka (1995) of The Morey Corporation sees partnerships lasting for more than one job. He believes in the system LEC has developed for negotiating with suppliers and follows the same system when dealing with Morey suppliers. Greisbach and Hartman of the Kolbenschmidt also looked at a long-term partnership as lasting for approximately five years. In the end, each of the suppliers agrees that LEC is an extremely professional organization. When LEC says it will do something, you can bank on it.

Results

The partnership building efforts of the Caterpillar LEC, of Lafayette, IN, is paralleling the material found in business and technology publications. I will have to say up front that I expected to find errors in the way LEC conducts its partnering activities. Instead I found a company that is extremely dedicated to building a quality product and realizes that it takes the cooperation of the entire vertical production chain to produce a quality product, at the most efficient price.

At no time in my research was the topic of communications mentioned as a necessary factor in the success of a partnership. It may be that this is such a necessary ingredient that it is taken as a "given". If information is not flowing within a company, that company cannot expect to work efficiently with a supplier or manufacturer. A communication system that is functional will have numerous incidence resulting in lost information. Engineering specs, Faxes, EDI messages all have the probability of

being lost in the black hole called corporate management. Active communications will stimulate imagination, result in quicker decisions and keep top management informed on both their internal workings and those of their partners.

The supplier selection criteria that Caterpillar has instituted is extremely demanding. The selection criteria must have high standards and those standards should apply across the board. Caterpillar's qualification system goes a step further than most manufacturers, since a major emphasis is placed on the evaluation of the supplier's management and business philosophies. Companies which do not have the same objectives will more than likely have a great deal of conflict negotiating contracts developing new products and improving existing product lines.

The execution of this project has opened managements eyes at both LEC and its suppliers. As I was conducting my interviews, I could sense each interviewee asking themselves questions like, "Is this how we really do business?" or "Are we really in a partnership or not?." The procedures used by LEC to form partnerships unconsciously exists within the confines of the corporate structure. However, no formal document existed which could be followed to guide LEC's management in the formation of new partnerships. My belief is that the partnership forming process happens in a purely random fashion.

Conclusions

Currently, LEC has moved beyond the animosity and voluntary price cutting stages. LEC is very tough with its suppliers and expects them to adhere to the guidelines established in their "Quality Guide" and "Eight Step Quality Plan" manuals. LEC is making significant efforts to reduce its supplier base and cut costs. The ultimate goal of LEC is to single-source with preferred suppliers in a partnership type

relationship. This system has not been perfected by LEC. Competitive bids are still accepted from competitive suppliers as a safety feature in case the supplier fails to deliver the component on time. The LEC is conducting multi-level agreements with suppliers and buyers in a vertical framework. I have no evidence that LEC is conducting horizontal ventures with competitive manufacturers of the same product.

The process used by LEC for forming partnerships is consistent with Stuart's conceptual model. Efforts to incorporate ISO 9000 standards into all products purchased from its suppliers is evidence that LEC recognizes the intensity of the competition the market they wish to serve. Products purchased from suppliers must be made better, cheaper and faster than those received by their competition. Resources are being committed to improve suppliers' manufacturability, quality and engineering capabilities, training and education of supplier staff and employees, and instituting statistical process control where applicable.

The degree of partnership with a supplier is related to the importance of the product and the length of time the supplier has been conducting business with LEC. LEC is moving to firm up relations with its overseas suppliers as they try to gain a competitive edge in the European market. Information is being shared between LEC and the European suppliers, but not as quickly as the information and technology that is being passed between long-time suppliers. Suppliers like Victor Reinz have a better understanding of LEC's business philosophy and are more willing to share assets like confidential technology.

The partnership building processes which I believe to be the most logical, incorporates the following five areas: an understanding of the firm's own internal communication system, the ability to evaluate the type of product demanded, the selection of the correct supplier selection criteria, the establishment of inter-

organizational channels of communication, and the conduct of the follow through after production has begun. Each of these steps is discussed briefly in the methodology developed as part of this report (see Appendix C).

Not all products require the need for a full blown partnership. One time only parts and some routine parts of insignificant proportions do not need a visit from a qualification team as frequently as a key player that continuously produces and supplies products such as circuit boards. Efforts must be made to identify the correct configuration of a team for conducting qualification and follow up visits to suppliers.

Perhaps the most important finding of this project is that the inter-organizational communication systems of partnerships must be evaluated continuously. My personal observations are that LEC believes that the communication systems in place now are efficient and doing the job. However, I believe that the suppliers would like more interaction with LEC than they currently have. According to Hedlund (1994), the "Japanese have a permanence of staff and inter-organizational relations with an intensive dialogue." Frequently firms place an engineer at a partnering facility during the design phase of a new product. To intensify the relationship, the engineer or a factory representative may need to be placed at the partner's location permanently. This would provide a constant flow of information to the manufacturer or supplier of the latest objectives and intentions of the partnering firm. This may not be a financially practical decision, but there is nothing that can take the place of the impact of face-to-face interaction.

The old saying goes that "the job is not finished until the paperwork is done" is true in partnerships. Efforts must be made by both members of a partnership to continue interactive communications after production has begun and contracts have been signed. "Information sharing between partners must encompass both the

strategic and technical information necessary to facilitate decision making and joint planning" (Graham, Daugherty & Dudley, 1994). Trust and the belief in the abilities of a partner or friend will only occur as long as there exists and active dialogue between the two. As long as efforts are made on the supplier's and the manufacturer's parts to communicate openly, the marriage they have will continue to grow stronger through good times and bad. LEC has all the necessary machinery to make a perfect partnership product, every time. The key is to put the correct machines in the correct place along the assembly line.

Recommendations

Success between to separate entities evolves around their ability to communicate with each other. Before any company forms a partnership, they need to review the Hedlund model shown in Figure 3. The company must be able to apply this model to their current infrastructure and will reasonable confidence, say that their internal communication process is in place. Once their communications are solidly in place, the company can start expanding into the world of partnership building.

LEC needs to reestablish the type of communications that are present at the time a new product is being developed. Company representatives were basically living at the partners location to facilitate the passing of timely information. Suppliers felt as though they were more of a key player in the development of a product than they presently do. With communication occurring randomly across telephone lines and fax machines, the personal interface is being lost.

If LEC is truly committed to establishing partnerships, then the practice of accepting traditional bids for various products should be eliminated. A supplier cannot feel confident that it has the trust of its manufacturing partner. This an indication that a long-term commitment does not really exist. I would recommend that LEC constantly

review its business objects to determine if a partnership type relationship with a supplier is indeed practical. If a partnership is practical, then LEC should use the methodology guideline developed as a result of this project to aide them in their quest to form partnerships.

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Appendix A

THE FORMATION OF PARTNERSHIPS

Development of Standard Operating Procedures For
The Formation of Partnerships With Suppliers of
The Caterpillar Corporation

Survey Questions for Suppliers of Caterpillar

Name of Supplier: _____

Name of Interviewee: _____

Position of Interviewee: _____

Partnership Questions

1. What do you think a partnership is?

2. How long have you been a supplier for Caterpillar?

3. How many different companies do you associate with as a supplier? (Is Caterpillar the only buyer?)

4. Would you consider yourself to be in a partnership type of arrangement with Caterpillar?

5. Does the level of activity that you have with Caterpillar represent a partnership-type of arrangement?

6. Considering the following stages, which do you feel most accurately describes your current partnership arrangement with Caterpillar?
Consider the following:

a. Pre-Partnership: (contract negotiations are currently on on-going in the hope of forming a long-term relationship).

b. Partnership Management-type activities: currently in process (types of procedures, problem-solving activities, pricing reviews).

c. Post Contract: evaluation of an on-going process (grading criteria, communication activities)

7. In order to have a true partnership between a supplier and a manufacturing buyer, the following activities must occur: information sharing, problem-solving activities, and inter-dependency. Companies which wish to develop strong partnerships will utilize the previously mentioned activities to develop a long-term planning horizon. Do any of the above mentioned activities occur between your company and LEC? (Yes or No. If an activity occurs please explain the concept involved in the activity and if an activity does not occur, please explain why.)

*8. When forming a partnership, does your company perceive the benefits achieved through the partnership as being shared mutually between you and LEC? (Benefits would include increase productivity, reduced scrap, reduced downtime, overall cost reduction, an increase in strategic market share. Please explain any of the areas mentioned that are significant to your company and why?)

9.Does your level of contact represent a true partnership? (i.e. Do you see Caterpillar for problems only or are they proactive in their partnering activities?)

*10. If you consider yourself to be a partner of Caterpillar's, what advantages would consider your company from being in such a position?

*11. Are there any disadvantages associated with being a supplier to Caterpillar?

12. There are risks involved when forming a partnership. For example a supplier may become depend on a manufacturer for business and change is production capability to suit that manufacturer's needs. What risks does your company feel are involved when forming a partnership?

13. How are responsibilities divided between your company and LEC when in a partnership type of arrangement, so that roles are clearly understood?

Relations

14. How frequently does a Caterpillar representative visit your facility?

a. When a Caterpillar representative visits your facility, what percentage of the visits are for:

business dealings (contracts) _____
training _____
work in progress reviews- _____
routine passing of information- _____
quality audits- _____

(put a summary of all of the suppliers in this question and place in the paper as a figure in the form of a graph)

*15. Manufacturers and suppliers use the qualities of price, service, on time delivery and quality as measures for conducting business with other companies. Of the criteria listed in the previous sentence, which does your company consider to be the most important, second most important, etc.? Briefly explain your rational for each of the criteria listed.

*16. Was the current contract agreement that you have with LEC achieved as a result of competitive bidding, the case in which you placed a bid and won the contract, or were you awarded the contract as a part of an ongoing relationship that your company has formed with LEC over time? (Explain as necessary)

17. Do you consider your company to be a primary supplier for Caterpillar? If not, what type of contract do you currently have with Caterpillar? If yes, why do you consider yourself a primary supplier for Caterpillar?

*18. Do you feel that your company is forced to react to the demands of LEC, such as in a change to a design specification, or is your company given the leeway to make design changes as it feels is necessary for the benefit of the contract at hand? (Explain)

a. When meeting changes to design specifications, does LEC allow for this to be financially rewarding to your company and is this covered in the contract? (Yes or No. Please explain.)

b. Who primarily initiates changes in the design of a given product which you are to supply for Caterpillar?

*19. When an error is detected in a product which you have contracted to provide for Caterpillar, how is the problem communicated to your company? (Formal/informal, corrective action required)

20. Briefly describe the type and length of the average contract that you have with Caterpillar. (i.e. one time only made to order product, or an ongoing continuous supply of products for a specific function at Caterpillar)

21. In your dealings with Caterpillar, what type of communication channels does your company use and how frequently? (i.e. telephone on a daily basis, FAX for the passing of design changes, face to face meetings to talk specifics about contracts)

22. Has your company ever received any help from Caterpillar in areas other than the typical engineering advice for changes in product specifications? If yes, how so?

*23. Does your company have any formal ties with Caterpillar other than as a supplier of a desired product?

24. Has being a supplier for Caterpillar improved you ability to supply your product in the market? (Yes or No. Please explain)

25. When you conduct work-in-progress meetings, who typically attends these meetings from your company? from Caterpillar?

26. Does your company openly share its production processes, technology improvements with Caterpillar? If yes, explain how.

27. Describe the procedures used to share technology with Caterpillar should your company do so?

* 28. Does your company conduct any kind of cross training with Caterpillar? If yes, describe how.

29. What percent of the products your company produces are used stateside?

30. Do you know of any specific examples that have resulted in an improvement because of the forming of a relationship with LEC? (i.e. production process, a reduction in costs, reduced frequency in inventory shipments due to better planning, reductions in scrap, lower overtime costs, etc.)

31. Are there any exist provisions associated in a contract agreement with LEC should a partnership be terminated for any reasons? (i.e. the dividing up of capital in a production location or finished inventory.)

32. What does your company consider a long-term commitment in terms of working contract negotiations with a potential manufacturer?

Survey Questions for Management of Caterpillar

Name _____

Position _____

*1. What do you think a partnership is?

*2. Part of the process of evaluating a potential supplier as a partner is that the management philosophies, values and goals of the buyer and supplier must be in agreement, committed to quality and cost improvement over time. How does LEC perform this evaluation with a potential supplier partner? (Explain the process if indeed a process does exist.)

3. How many major suppliers do you have and what do you use to classify a supplier as being a major supplier?

4. How many suppliers do you deal with on a day to day basis?

*5. In order to have a true partnership between a supplier and a manufacturing buyer, the following activities must occur: information sharing, problem-solving activities, and inter-dependency. Companies which wish to strong partnerships will utilize the previously mentioned activities to develop a long-term planning horizon. Do any of the above mentioned activities occur between LEC and its suppliers? (Yes or No. If an activity occurs please explain the concept involved in the activity and if an activity does not occur, please explain why.)

6. Would you consider LEC to be in a partnership type arrangement with the _____ company/corporation?

7. Considering the following stages, which do you feel most accurately describes your current partnership arrangement with _____company/corporation?
Consider the following:

a. Pre-Partnership: (contract negotiations are currently on on-going in the hope of forming a long-term relationship).

b. Partnership Management-type activities: currently in process (types of procedures, problem-solving activities, pricing reviews).

c. Post Contract: evaluation of an on-going process (grading criteria, communication activities)

*8. When forming a partnership, does your company perceive the benefits achieved through the partnership as being shared mutually between LEC and its suppliers? (Benefits would include increase productivity, reduced scrap, reduced downtime, overall cost reduction, an increase in strategic market share. Please explain any of the areas mentioned that are significant to your company and why?)

9. The most distinguishing feature between traditional and partnership price is the contract management process carried out after the production job is under way. What are the management techniques used at LEC to ensure continuous, competitive pricing for long-term partnership commitments? (Explain how this process works at LEC).

*10. What advantages are achieved through a partnership with a supplier?

*11. Are there disadvantages associated with forming partnerships with suppliers?

12. There are risks involved when forming a partnership. For example a supplier may become depend on a manufacturer for business and change it's production capability to suit that manufacturer's needs. What risks does your company feel are involved when forming a partnership?

13. How are responsibilities divided between your company and LEC when in a partnership type of arrangement, so that roles are clearly understood?

*14. How frequently does a LEC representative visit a suppliers facility? (Who does the visiting, in what capacity, what are the results of the visit?).

*15. Manufacturers and suppliers use the qualities of price, service, on time delivery and quality as measures for conducting business with other companies. Of the criteria listed in the previous sentence, which does your company consider to be the most important, second most important, etc.? Briefly explain your rational for each of the criteria listed.

16. How are contracts determined with a supplier at LEC? (i.e. competitive bidding, past performance preferential treatment, long-term agreements).

17. Who primarily initiates changes in design specifications?

18. Are changes in design specifications financially rewarding for a supplier?

*19. When an error is detected in a product which you have contracted to a supplier, how is the problem communicated to the supplier? (Formal/informal, corrective action required)

20. When you conduct work-in-progress meetings, who typically attends these meetings from your company? from Caterpillar?

21. Does LEC openly share its production processes, technology improvements with its suppliers? If yes, explain how.

* 22. Does LEC conduct any kind of cross training with its suppliers? If yes, describe how.

23. What percent of the products your company produces are used stateside?

*24. Do you know of any specific examples that have resulted in an improvement because of the forming of a relationship with LEC? (i.e. production process, a reduction in costs, reduced frequency in inventory shipments due to better planning, reductions in scrap, lower overtime costs, etc.)

25. A purchasing manager must be aware of the production processes of potential suppliers. What method is used to review a supplier's production process so that it can be determined if the production process is compatible with LEC's needs?

Appendix B

Development Agreement

_____Name and address of partner I , hereinafter _____,

_____Name and address of partner II, hereinafter _____,

_____Name and address of partner III, hereinafter _____,

and Caterpillar Inc., 100 N.E. Adams Street, Peoria, IL, 61629, hereinafter "Caterpillar", agree as follows:

1. PROGRAM

1.1 _____ is a manufacturer of engine pistons and has expertise in the field.

1.2 _____ is a manufacturer of piston rings and has expertise in the field.

1.3 _____ is a manufacturer of cylinder liners and has expertise in the field.

1.4 _____ Caterpillar is a manufacturer of diesel engines and has expertise in the field.

1.5 Caterpillar seeks to work together with _____ , _____ , and _____ in the design and development of the combustion chamber, including the design of the piston, piston rings, and cylinder liner of the combustion chamber, for Caterpillar 3600 series diesel engines ("Program").

1.6 The parties acknowledge that, as a result of this Agreement, certain piston, piston ring, and cylinder liner developments may result under the Program which are applicable to a variety of internal combustion engines ("Developments"), but the term "Developments" does not include pistons, piston rings, and cylinder liners that are developed under the Program which are particularly adapted for use with Caterpillar 3600 series diesel engines ("Caterpillar Developments").

2. **COST**

Unless otherwise mutually agreed to in writing, each party will bear its own costs and expenditures under this Agreement.

3. **TERM AND TERMINATION**

The Program shall begin on the effective date of this Agreement. Any party may terminate its participation in the Program at any time by giving at least sixty (60) calendar days' prior written notice to the other parties, during which time the remaining parties may terminate this Agreement. If at the end of the sixty (60) calender days the remaining parties have not terminated this Agreement, the Program shall continue under the terms and conditions set forth herein.

4. **INVENTIONS**

For the purposes of this Agreement, "Intellectual Property" shall mean patents and patentable inventions, copyrights, trade secrets and proprietary information made under the Program.

4.1 Intellectual Property related to Developments that is conceived and/or first reduced to practice exclusively by one party during this Program shall be the sole property of such one party.

4.2 Intellectual Property related to Developments that is conceived and/or first reduced to practice jointly by two or more parties during this Program shall be the jointly owned property of such two or more parties.

4.3 Intellectual Property related primarily to Caterpillar Developments that is conceived and/or first reduced to practices either solely by one party during this Program or jointly by two or more parties during this Program shall be the sole property of Caterpillar, and such one party and such two or more parties agree to assist in obtaining patent protection therefore and to assign (and do hereby assign) to Caterpillar ownership of Intellectual Property related primarily to Caterpillar Developments.

5. **LICENSES**

5.1 Each party hereby grants to Caterpillar an irrevocable royalty-free nonexclusive worldwide license, including the right to sublicense to Caterpillar's subsidiaries and affiliates of which Caterpillar owns at least 50% of the voting shares, to make, have made, use and sell Developments and Caterpillar Developments made under this Program.

5.2 Except as provided in paragraph 5.1 above, nothing in this Agreement shall be deemed to grant to one party a license directly or by implication under any patent or patent application owned or controlled by any other party.

6. PROPRIETARY INFORMATION

6.1 Any information owned by a party prior to this Agreement and transmitted to another party shall be considered "Confidential Information" if i identified by the transmitting party as such in writing within sixty (60) days after its transmittal, and shall remain the property of the transmitting party.

6.2 Except as otherwise provided, each party agrees to bind themselves and any of their respective subsidiaries or affiliates to hold in confidence Confidential Information received from another party and to use it only in connection with the work performed under this Agreement.

Confidential Information disclosed by one party shall not be subject to the confidentiality obligations of this Paragraph if the Confidential Information:

(a) is now or subsequently becomes publicly known or available by publication, commercial use or otherwise without breach of this Agreement: or

(b) can be shown by written records of the receiving party to be known to the receiving party at the time of receipt and not presently subject to an obligation of confidentiality; or

(c) is subsequently rightfully furnished to the receiving party by a third party without an obligation of confidentiality; or

(d) is independently developed by employees and/or consultants of the receiving party who have not had access to information of the disclosing party; or

(e) is explicitly approved for public release by prior written authorization of the disclosing party; or

(f) is required to be disclosed pursuant to governmental or judicial process provided written notice is promptly provided to the disclosing party in order that it may have every opportunity to intercede in such process to contest such disclosure.

6.3 The confidentiality obligations under this Paragraph shall survive termination of this Agreement for whatever reason and shall end only after five (5) years from the date Confidential Information is returned or destroyed.

7. COMMERCIAL OBLIGATIONS

7.1 Caterpillar agrees to buy all of its requirements for pistons developed under this Agreement from _____ for use with Caterpillar 3600 series diesel engines for a period of three (3) years beginning on the date a commercially viable piston is developed ("Commercial Period"). Caterpillar shall be obligated under this paragraph only so long as the price and delivery terms of _____ are competitive and only so long as such pistons meet Caterpillar's specifications. After the Commercial Period, Caterpillar will be free to use any supplier of such pistons for use with Caterpillar 3600 series diesel engines, but will continue to treat _____ as a preferred supplier.

7.2 Caterpillar agrees to buy all of its requirements for piston rings developed under this Agreement from _____ for use with Caterpillar 3600 series diesel engines for a period of three (3) years beginning on the date a commercially viable piston ring is developed

("Commercial Period"). Caterpillar shall be obligated under this paragraph only so long as the price and delivery terms of _____ are competitive and only so long as such pistons meet Caterpillar's specifications. After the Commercial Period, Caterpillar will be free to use any supplier of such piston rings for use with Caterpillar 3600 series diesel engines, but will continue to treat _____ as a preferred supplier.

7.3 Caterpillar agrees to buy all of its requirements for cylinder liners developed under this Agreement from _____ for use with Caterpillar 3600 series diesel engines for a period of three (3) years beginning on the date a commercially viable cylinder liner is developed ("Commercial Period"). Caterpillar shall be obligated under this paragraph only so long as the price and delivery terms of _____ are competitive and only so long as such pistons meet Caterpillar's specifications. After the Commercial Period, Caterpillar will be free to use any supplier of such cylinder liners for use with Caterpillar 3600 series diesel engines, but will continue to treat _____ as a preferred supplier.

8. MISCELLANEOUS

8.1 All notices under this Agreement are to be given in writing and shall for all purposes be deemed to be fully given and received if when deposited in the mail is sent by registered mail, postage prepaid, to the respective parties at the following addresses:

supplier 1 address_____
_____
_____

supplier 2 address_____
_____
_____

supplier 3 address_____
_____
_____

Caterpillar: Caterpillar Inc.
Patent Department - AB6490
100 N. E. Adams Street
Peoria, IL 61629-6490

Any party hereto may change its address for the purposes of this Agreement by giving the remaining parties written notice of its new address.

8.2 Each one party agrees to indemnify, defend and hold harmless the other party(s), its directors, officers, employees and agents, from all claims and demands, including cost, litigation expenses, counsel fees and liabilities incurred in connection therewith, arising out of injury to or death of any person or damage to property proximately caused by the one party's act or omissions which arise in connection with the performance of the work hereunder while the one party is on premises owned directly or indirectly by the other party(s).

8.3 Nothing herein contained shall be deemed to create any relationship of agency, joint venture, or partnership between the parties hereto.

8.4 This Agreement shall not be assignable or otherwise transferable by any party without prior written consent of the other parties.

8.5 This Agreement is in English language only, which language shall be controlling in all respects, and all versions hereof in any other language shall be for accomadation only.

8.6 This Agreement shall be construed, interpreted, and applied in accordance with the laws of the State of Illinois, United States of America, exclusive of conflicts of law.

8.7 This Agreement embodies the entire understanding between the parties with respect to its subject matter, and there are no prior representations or warranties between the parties relating to it, and all prior agreements relating to it are hereby superseded. This Agreement cannot be altered, enlarged or abridged except by an agreement in writing signed by the parties which specifies that it is a supplement or amendment hereof.

8.8 Each party warrants that it has the full right to enter into and execute this Agreement and to undertake the obligations and grant the rights set forth herein. The foregoing warranty is expressly in lieu of any other warranty, expressed or implied, including any warranty or merchantability or fitness for a particular purpose. All prototypes supplied hereunder are experimental in nature and are supplied without warranty of any kind.

8.9 Nothing contained herein shall be construed as requiring any party to perform any acts in conflict with the laws of their respective governments pertaining to the export of Intellectual Property.

IN WITNESS WHEREOF, the parties have caused this Agreement to be duly executed in duplicate effective on the date last signed below.

(NAME)_____

By: _____

Name: _____

Title: _____

Date: _____

(NAME)_____

By: _____

Name: _____

Title: _____

Date: _____

(NAME)_____

By: _____

Name: _____

Title: _____

Date: _____

CATERPILLAR INC.

By: _____

Name: _____

Title: _____

Date: _____

Appendix C

C A T

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Methodology

for the

Establishment

of

Partnerships

C A T

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Methodology

for the

Establishment

of

Partnerships

Caterpillar Partnership Methodology

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Caterpillar Partnership Methodology

I. Introduction

Caterpillar Large Engine Center (LEC) of Lafayette, Indiana recognizes the competitive advantage achieved through the formations of partnerships with its suppliers. This manual is designed to serve as a guide in the formation of partnerships with suppliers. The formation of partnerships will proportionately decrease overall costs, increase profits and lead to increased customer satisfaction. Working closely with our suppliers will help to guarantee a prosperous future for Caterpillar and the employees who make it happen. This methodology guideline, outlines the sequence necessary for Caterpillar to form partnerships in the future and to secure those formed in the past.

II. Purpose

The purpose of this manual is to provide the management of Caterpillar with a ready reference for the establishment of partnerships. This methodology is to serve as a guide for the development of agreements with suppliers. Caterpillar is dedicated to securing its position as the premier producer of products in its field. To be a true leader in the evolving, highly competitive world market, we must first understand the market. By understanding the market, we will relate better to its suppliers who play such a significant role in their common future.

III. Approach

A. Overall Concept

Five areas are addressed in this manual. They serve as a guide for the formation of effective partnerships. The areas of consideration include: an understanding of Caterpillar's internal communication system, the ability to evaluate the type of product demanded, use of the appropriate supplier selection criteria, the establishment of inter-organizational channels of communication and follow through that is necessary after production has begun.

B. Implementation

Senior management has responsibility to ensure that the methodology outlined in this procedural guide is current and practiced. Procurement is the key contact with suppliers in the day to day development of the business partnership. Their understanding and use of this guide will ensure satisfied customers.

IV. Internal Communications

A. Discussion

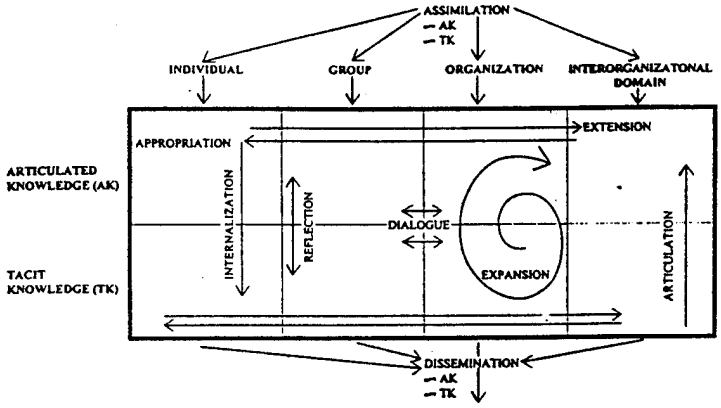
The Hedlund model is to be followed to fully understand the internal communication process at LEC. In order to maximize the benefits of this model, it is important to understand that a competitive edge lies in our organizational capabilities. The LEC is organized into "Small Business Units", each of which is focused on satisfying the customers within its market niche. In order to stay ahead of competitors, the business process must be inductive in nature, with a constant array of lists needing to be accomplished.

A sound communication system will promote multiple improvements in our products and processes, causing rapid, incremental improvements of our knowledge base. We must establish a staff capable of conducting interorganizational relations through an intensive dialogue, which relays LEC's business philosophy.

B. The Hedlund Model

The Hedlund model depicted on the following page is to be used as a guide for the interaction necessary to facilitate the flow of knowledge within LEC. The model shows how "Tacit" and "Articulated" knowledge works within a firm. Tacit knowledge is defined as the nonverbalized or non-verbalizable, intuitive, and unarticulated knowledge that is passed within a group. Articulated knowledge is specified verbally or in writing, computer programs, patents, or drawings. The concept model demonstrates the interaction between carriers of information including individuals, groups, the organization and interorganizational domains. All of these carriers of information must be functioning properly using the concepts of articulation and internalization; extension and reflection; and assimilation and dissemination.

THE COMMUNICATION PROCESS



C. How the Hedlund Model Works

Articulation refers to tacit knowledge being made explicit, articulated. This can take place at all four levels in the model. Articulation is essential in facilitating transfer of information, but also for its expansion and improvement, allowing for open scrutiny and critical testing. Internalization encompasses how an individual understands and uses information. This occurs when articulated and tacit knowledge mix and cause reflection. Extension is the transfer of knowledge from lower to higher agency levels in articulated or tacit form. An example of articulated knowledge when a company transfers drawings of its planned or future products to its subcontractors. The transfer of tacit knowledge occurs during the teaching of complex, practical skills, as when a management consultant teaches a group of younger colleagues by working together with them on a project. Appropriation happens when a company teaches its new employees about its products.

Articulation is used to facilitate the transfer of information. Internalization encompasses understanding and using information. This occurs when articulated and tacit knowledge mix invoke thought processes or reflection. Extension is the transfer of knowledge from lower to higher agency levels in articulated or tacit form. An example of articulated knowledge would be when CAT transfers drawings of its planned or future products to one of its current suppliers. The transfer of tacit knowledge occurs during the teaching of complex, practical skills, on the assembly line or through one of our many workshops. At CAT we will assure that appropriation happens by keeping each of our employees updated on the products they build and the employees' importance to the success of our company.

V. Product Evaluation

Product Evaluation Criteria

Product type determines the supplier selection. Before the supplier is selected, the type of product must be determined. Each type of product has its own set of selection criteria. The product must be chosen on the ability of the supplier to meet the performance criteria set forth in the product evaluation flowchart shown on the adjacent page. Each type of product is defined below and an example provided for each. The performance criteria shown in the flow chart is listed in the current sequence of importance. This order may change over time and should be updated appropriately. Once the type of product is determined and the performance criteria identified, a commodity team will be configured to evaluate the supplier's ability to provide the product. Again, a recommended team is shown, but must also be reviewed for adequate configuration on a continuous basis. The product evaluation criteria flowchart is shown on the following page.

1. Routine Order - no problems associated with learning to use and no questions on the functional capability of the product (a hand drill).

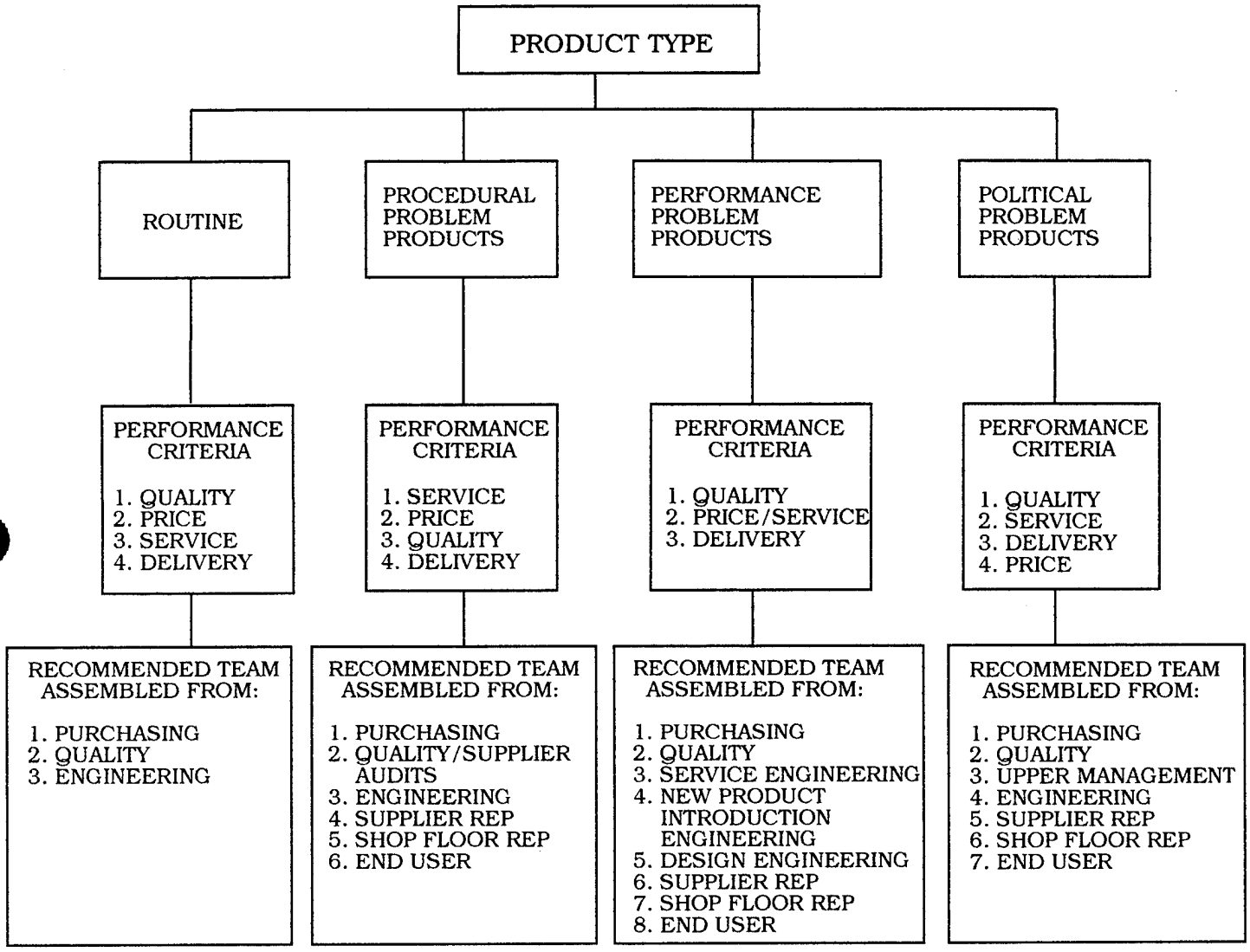
2. Procedural Problem Products - There is no question about capability, but there may be problems in learning to use the product (a computerized milling machine).

3. Performance Problem Products - There exist some doubt as to whether the product will perform satisfactorily in application it is being considered for (a conveyor system for the movement of product within a storage facility.

4. Political Problem Product - This product requires a large outlay of capital and the buying decision is likely to involve people from several different functional areas within the organization (a new boring machine for engine blocks).

Caterpillar Partnership Methodology

PRODUCT EVALUATION FLOWCHART



VI. Supplier Selection Process

A team leader is chosen to lead the supplier selection effort. The team leader will be a senior buyer or person knowledgeable in the product being procured. The other team members consist of members representing key internal customers. The team will assess the capacity of the market to produce the desired product, what competition exists in the market and what level of expertise is necessary to deal effectively in the market.

It is the responsibility of the team leader to ensure that the team possesses the expertise necessary to conduct negotiations with potential suppliers. Should the team lack the required expertise, the team leader will pool existing suppliers of CAT for the desired expertise. If the team leader cannot acquire the necessary expertise, an appropriate individual will be selected through an interview process and then trained to a level capable of negotiating with potential suppliers. If it is determined that the level of expertise is beyond the capabilities of the team and the existing supplier base, the product will be eliminated as a procurable item or deferred until appropriate expertise can be acquired.

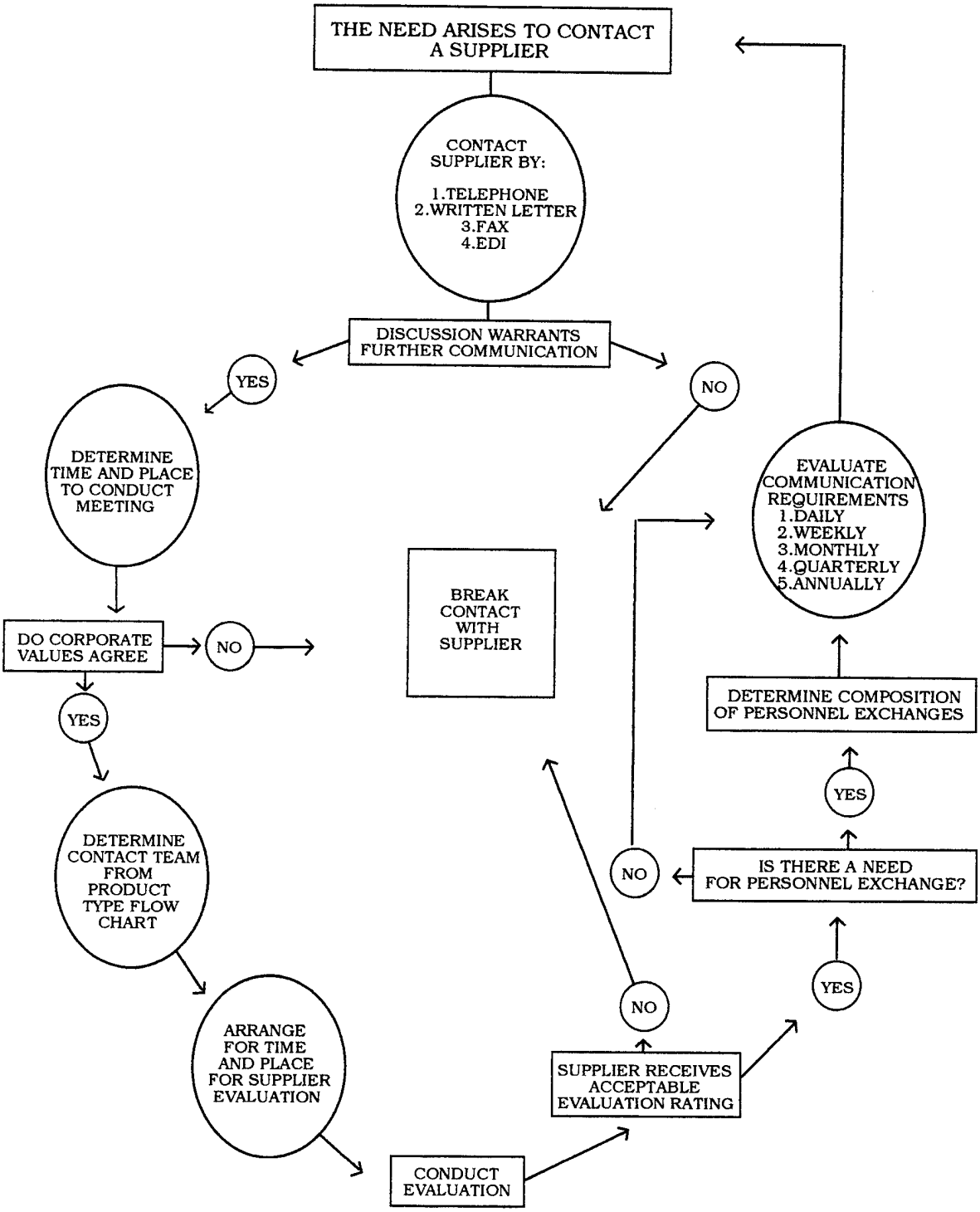
The next step in the supplier selection process is to develop a strategy for evaluating potential suppliers. As a minimum, the supplier will be evaluated according to the criteria listed below. A grade between 1 and 10 will be assigned to the evaluated supplier. A score of 6 must be attained by a potential supplier before negotiations will be considered by the commodity team. A score of 10 is considered perfect during an evaluation.

- management philosophy and structure
- financial capacity
- engineering capabilities and technologies
- manufacturing capability and processes
- quality of the product
- logistics/delivery of product
- commercial practices
- marketing ability and responsiveness

All suppliers will be evaluated following a standardized evaluation method. However, each supplier is considered unique and will also be evaluated for their specific capabilities. Proper attention will be given to areas identified as needing extra emphasis.

Caterpillar Partnership Methodology

SUPPLIER SELECTION PROCESS

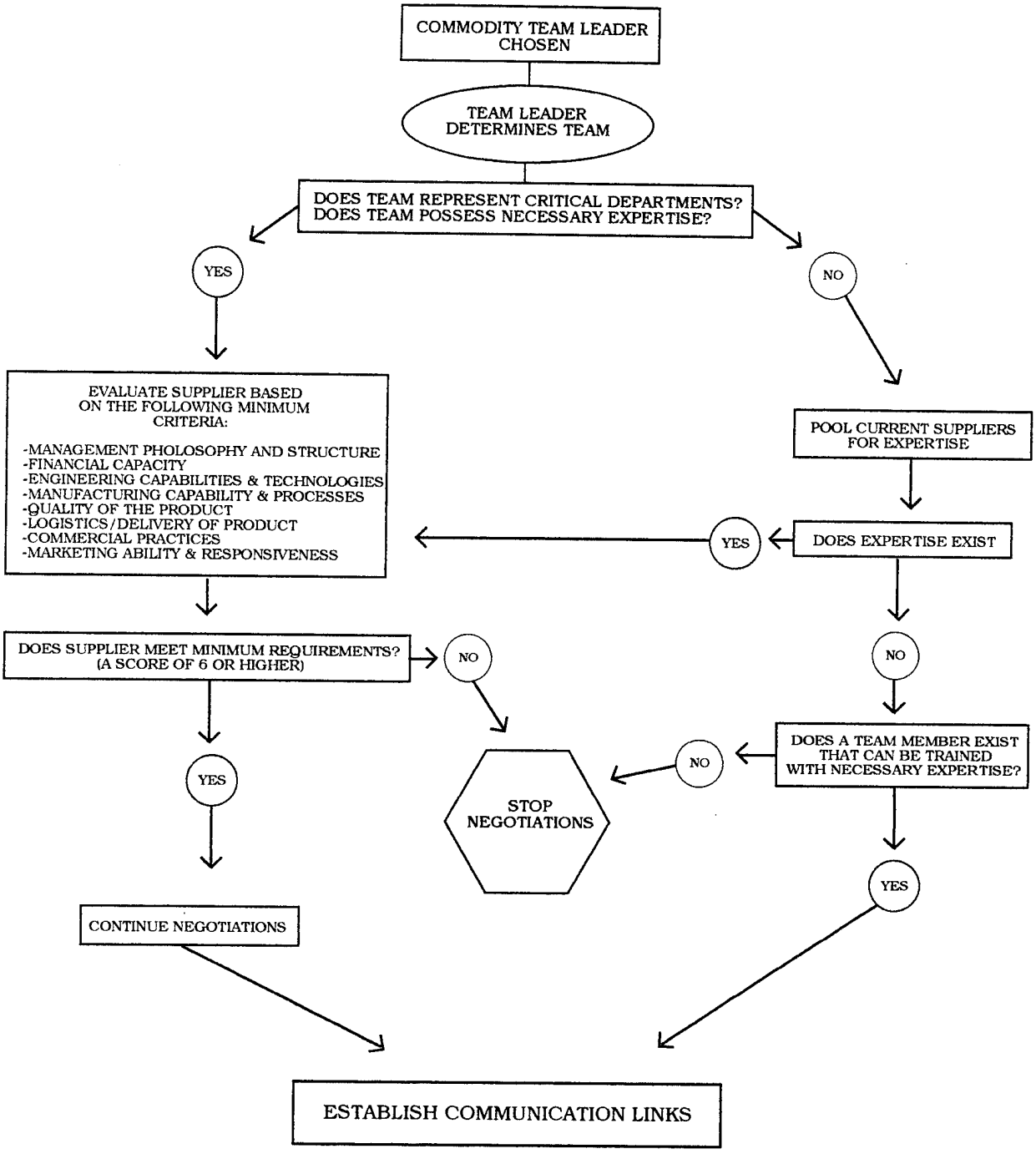


VII. Interorganizational Communications

A true partnership will "grow" and mature over time. At LEC we must ensure an ongoing commitment to our newly partnered suppliers. It is critical we interact with our suppliers by determining goals that are mutually beneficial to each of us. The establishment of goals is a dynamic process involving interorganizational communications. Once the supplier market is chosen, LEC management relies on the commodity team, chosen from the supplier selection criteria, to establish the networks necessary to have active communications. This is demonstrated on the following page.

Caterpillar Partnership Methodology

INTERORGANIZATIONAL COMMUNICATIONS



VIII. Following Through on Partnership Agreements

Objectives

LEC is dedicated to satisfying its customers. Top management sets minimum levels of communication to ensure continuous interaction with partners after contractual agreements are completed. MRP information is updated and available daily to all LEC suppliers via EDI. Business objectives are planned annually with suppliers to set objectives for quality, pricing, delivery and service criteria. Business strategy meetings are conducted quarterly at alternate sites to review the progress of strategic goals. Each month the objectives set at the quarterly meeting are reviewed and revised to meet market and customer requirements.

LEC sets high performance goals for itself and expects the same from all of its suppliers. Supplier performance is constantly monitored and those that fall below agreed upon standards will be provided necessary assistance to raise their standards to an acceptable level again. Each supplier is evaluated for the type of communication necessary to keep performance high. As the supplier shows they are capable of meeting LEC's tough quality and performance standards, frequent visits will become less necessary. All available communication means will be utilized by CAT and it's suppliers to keep the lines of communication open. CAT will openly cross-train or share engineer and available engineering technology with supplier partners as the partnership becomes stronger.

IX. Maintenance of Partnerships

LEC is committed to improvement over time. Part of maintaining this commitment is the ability to provide purchasing personnel whose attitudes and abilities reflect the type of partnership LEC wishes to have in the long-term. Managing supplier partnering type arrangements requires personnel who possess skills that are highly analytical, capable of solving complex problems, inventive in nature, and knowledgeable in the processes of suppliers. The most capable personnel must be put in those positions that require a high degree of interaction with suppliers.

LEC must stay focused on improving the suppliers capability rather than strictly aiming to improve our own products. Our supplier development programs pick where our methodology for forming partnerships stops. LEC must remain focused on the long-term goal of developing a supplier who can deliver a product that is cheaper, of better quality and faster than the suppliers of competitive manufacturers in our market. To do this, clear goals must be established and resources allocated to maintain the lines of communication with suppliers. Joint interaction and information sharing between LEC and its suppliers will ensure a continuous improvement in market competitiveness and market share for the future.

X. DEFINITIONS

Articulate knowledge - knowledge which is specified either verbally or in writing, computer programs, patents, drawings, etc.

Tacit knowledge - knowledge which is nonverbalized or non-verbalizable, intuitive,unarticulated.

Articulation - Tacit knowledge which is made explicit, and articulated in great detail.
This can take place at all four levels in the model

Individual - A worker or management official which possesses knowledge gained through schooling and job related work experience.

Group - the interaction of individuals which fosters the exchange of information between individuals

Organization - The consolidated efforts of several groups, organized for a common cause.

Interorganizational domain - Constitutes the suppliers, customers, competitors and other market factors which must be understood on a day to day basis.